

supplies, pasteurization of milk, and vaccination. Owing in large part to such opposition, it has taken 50 years, for example, to get widespread acceptance of chlorination. I hope that urban communities which have not yet fluoridated their water supply will not be denied this health benefit for a comparable period.

It is nothing short of tragic to deny millions of children the benefits, now and in their later years, of healthy teeth, particularly when, in addition to the scientific evidence that points to the efficacy of fluoridation, public opinion polls indicate that a majority of citizens desire to take advantage of this established health measure.

Yet this is clearly what is happening in a

number of communities large and small. For example, a poll by Elmo Roper and associates in 1957 showed that 57 percent of the people in cities of 1 million and over said fluoridation was a good idea, while only 20 percent said it was not. In communities of 100,000 to 1 million the response was 50 percent for and 19 percent opposed, while in communities of 2,500 to 100,000 it was 54 percent for and 24 percent against.

As long ago as 1953, when fluoridation was still relatively new and before the opposition became fully organized, a poll by Dr. George Gallup showed that people who knew about fluoridation favored its adoption as a community health measure by a margin of nearly four to one.

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## Report on Fluoridation in the United States

Dental decay is recognized as man's most widespread chronic disease. Few persons escape. No social stratum or age group is immune. A decayed tooth never heals by itself, by prescription, or by advice. About 97 million people in the United States have decayed teeth requiring treatment; more than 21 million others are edentulous; the average high school graduate has had 10 teeth attacked; and family dental bills total \$1.7 billion annually although only 40 percent get treatment. If everyone who needed dental care wanted it, there would not be enough dentists to provide it. The current progressive accumulation of dental disease is a heavy national burden—painful, costly, and disfiguring. This serious health problem remains largely neglected because of the undramatic nature of the disease, cost of treatment, the widespread tendency not to regard dental decay as a hazard, and insufficient professional manpower to provide care. This combination of factors points to the need for a preventive measure that is effective, safe, in-

expensive, convenient, widely acceptable, and automatic. The fluoridation of community water supplies meets these requirements.

Fluoridation is the adjustment of fluoride-deficient communal water supplies to the optimal level by adding small, but precise amounts of fluoride-containing compound to yield in solution one part of fluoride in every million parts of water. In effect, it supplements the daily ingestion of fluoride to a level which effectively and safely prevents up to 65 percent of the dental decay among children, and provides protection and benefits that continue into adult life. In principle, water fluoridation is similar to standardized water-treatment procedures designed to promote the health of consumers.

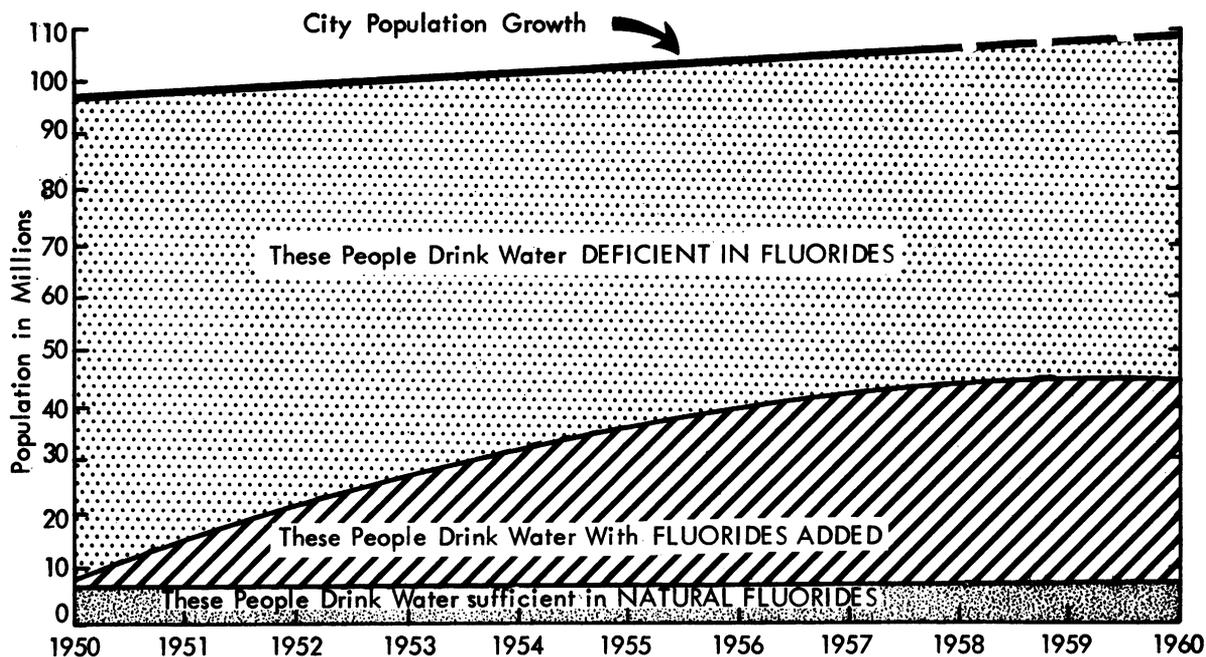
### Research

The early history of the fluorine and dental decay relationship goes back to the last quarter of the 19th century, when clinicians noted that less tooth decay accompanied mottled enamel. In 1916, Dr. Frederick McKay reported mottled enamel to be a waterborne disease, which in 1931 was discovered to be caused by excessive fluorides. A hypothesis evolved that trace amounts

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## Urban Growth and the Fluoridation Lag



of fluoride in water might inhibit dental caries. A series of epidemiological studies was carried out by the Public Health Service led by Dr. Trendley Dean and his associates. They found a strikingly low prevalence of dental decay associated with 1 ppm fluoride in the drinking water. These studies in natural fluoride areas were confirmed by animal experimentation in laboratories and by independent scientists in other countries.

In light of the evidence that no undesirable effects accompanied the dental benefits derived from water supplies naturally containing 1 ppm fluoride, three controlled fluoridation programs were begun independently in 1945 to determine whether these benefits could be duplicated by controlled fluoridation. The results of these and other studies were remarkably uniform and demonstrated that the use of drinking water containing 1 ppm fluoride: (a) produces identical dental and general effects whether the fluoride occurs naturally or is added by mechanical means; (b) effectively, safely, and economically prevents up to 65 percent of tooth decay; and (c) does not produce observable mottling of the teeth.

Although alternative techniques and vehicles have continued to be tested, none of them to

date can substitute for fluoridation as a public health measure. (See statement on proposed alternatives, p. 517.) In the absence of water fluoridation or, where water fluoridation cannot be practiced, direct application of topical fluorides to the teeth has been found to reduce caries. However, the cost in professional time is rather high and limits this method on a large-scale public health basis.

### Endorsements

After a thorough examination of all scientific evidence relating to the safety, effectiveness, and practicability of fluoridation, the Public Health Service endorsed it in 1951. Since that time many communities throughout the Nation have instituted fluoridation programs. Careful study of their experience with this measure plus continuing scientific research have provided additional evidence supporting fluoridation. The literature about the relation of fluorides to health now exceeds 8,500 references.

In this country fluoridation is approved by every major scientific and professional organization having competence in the field. It has also been approved by the World Health Or-

ganization, by professional and scientific associations in many foreign countries, and by responsible health officials throughout the world.

### **Present Status**

Today more than 42 million people in the United States (or about 1 in every 3 persons provided water by community water supplies) are drinking water containing the minimum or higher level of fluoride recommended. Of these, 35 million in 1,778 communities are supplied water in which the fluoride level is controlled, and 7 million in 1,903 places use water naturally containing 0.7 ppm or more fluoride. Since 1950, the number of persons provided with fluoridated water in this country has increased by about 34 million. Fluoridation programs are also in operation in 20 foreign countries.

Water engineers report that the addition of fluorides to public water supplies is similar to chlorination and other procedures widely employed in waterworks practice. Fluoridation presents no administrative, technical, or industrial problems of any consequence. Presently, five fluoride compounds are used: sodium fluoride, sodium silicofluoride, hydrofluosilicic acid, ammonium silicofluorides, and fluorspar. Costs of fluoridation vary according to the amount and kind of compound required, but the average cost is 10 cents a year per person. A device developed by Public Health Service engineers now enables communities to use fluorspar, further reducing the costs by two-thirds.

Current investigations by the Public Health Service related to fluoridation include continuing evaluation of community water fluoridation programs; improving technical, control, and testing procedures; developing individual fluoridators for homes and schools in rural areas; testing various fluorides for a more effective agent to be applied topically to the teeth; and developing practical methods for removing excessive fluorides from water supplies.

### **Decline in Community Acceptance**

At first glance, the acceptance of fluoridation during the last 8 years appears satisfactory.

A closer look, however, reveals that most of the gain has been made in the larger cities. Sixty-six percent of the Nation's cities with populations of more than a half million, and 32 percent of the cities with populations between 10,000 and 500,000 have fluoridation programs. By contrast, only 17 percent of those communities having populations of 2,500 to 10,000 and 5 percent of communities with populations of less than 2,500 have such programs. Consequently, most of the people benefiting from this measure live in the larger cities.

Of special concern is the steady decline in the rate of community acceptance in the past 6 years. Community acceptance proceeded slowly from 1945 to 1950, the early years of the demonstration studies. By 1952, however, most scientific and professional groups had examined the evidence and formally approved water fluoridation. That same year 243 communities instituted fluoridation programs. The following year, 1953, was the peak year during which 378 separate communities adopted fluoridation. Since 1953 the number of separate communities starting fluoridation programs has declined. Only 145 places began fluoridation programs in 1958. Moreover, the number of communities which discontinued fluoridation programs in the past 5 years has steadily increased.

The question may well be raised as to why this slow rate of acceptance has occurred, and what steps need to be taken to accelerate the utilization of this measure for the improvement of our Nation's health. Obviously, the big job is yet to be done.

There are two circumstances which explain the initial acceleration and subsequent slow-down in community acceptance of fluoridation. During the earlier years (1945-52) fluoridation was instituted by governing bodies that were convinced by the weight of scientific evidence. Only occasional objections were voiced against the measure. By late 1952, however, the formerly disorganized and sporadic opponents joined forces, forming two national organizations specifically to oppose fluoridation. As a result, the opponents obtained substantial resources; and, by employing a wide variety of tactics, they have been able to thwart the institution of fluoridation.

The other circumstance may be that the com-

munities which normally accept new health measures readily had done so by late 1952. Thereafter the rate of acceptance may have declined somewhat because it is more difficult to get acceptance by the remaining communities.

### **Organized Opposition**

Four different groups oppose fluoridation—those who oppose it on principle; those in whom the measure arouses personal anxieties; those who acquire status, political gain, or personal profit; and those who are uninformed. Opponents, mostly laymen, but also including a few scientists, physicians, and dentists, carry on a nationwide campaign through their two national organizations in the United States.

It is quite evident that a relatively few people can create doubt and fear in many others who otherwise would accept the advice of competent experts. Antifluoridationists publish a monthly newspaper and submit articles to medical journals, popular magazines with national circulations, and newspapers. A book, "The American Fluoridation Experiment," has become the opposition textbook and is widely distributed. Opponents have delayed fluoridation by numerous injunctions. They have filed suits unsuccessfully in more than a dozen State courts. Two cases were even appealed to the U.S. Supreme Court where they were dismissed. Opponents send a steady flow of letters and literature to Federal, State, and local officials. As one after another irresponsible claim is refuted, opponents change their attack. Local merchants and editors frequently are intimidated by threats and harassing telephone calls. Proponents are abused by smear tactics and public heckling, and they and their families are threatened with physical harm. It is noteworthy that opposition in many communities comes in the first instance, not from residents of the city considering fluoridation, but from elsewhere.

Objections to fluoridation, however unfounded or unrealistic, strike a sympathetic chord in a sizable number of people. Continuous sensational assertions of an emotional type have far more effect on public opinion than the precise correct statements of scientists. Furthermore, some people, once persuaded to op-

pose something they do not understand, seldom change their attitude.

From coast to coast, numerous strife-torn communities, confused and divided over a word that was not even in their vocabulary a generation ago, can attest to the effectiveness of the antifluoridation campaign. The referendum is a particularly effective framework in which to oppose fluoridation. Irresponsible statements, misleading and horrifying, have succeeded in defeating fluoridation by referendums in Seattle, Wash., San Diego, Calif., Birmingham, Ala., Columbus, Ohio, and well over 230 other communities. By referendums, twice as many communities have rejected fluoridation as have adopted it.

Several factors contribute to the problem. Tooth decay is not a dramatic, infectious, crippling, or killing disease. Most people have learned to live with their dental problems and do not regard them as sufficiently serious to require treatment. The scientific arguments for fluoridation are not simple; fluoridation cannot compare with the drama of the wonder drugs, and the benefits to be derived from it cannot be observed for more than a decade—even then they are not obvious.

Viewed in historical perspective, the opposition to fluoridation has been quite similar to that which arose when other public health measures were introduced, particularly chlorination, pasteurization, immunization, and vaccination. The psychological bases for objecting to fluoridation are the same: (a) fear of being physiologically injured by a potentially noxious agent; (b) ethical aspects, with special concerns about invasion of human rights; (c) rejection of a new discovery that conflicts with entrenched beliefs; and (d) resistance to change.

The crux of the problem is that a relatively few people are blocking the progress of an approved health measure. By so doing they are not only withholding health benefits from a large portion of the population, especially children, but they are perpetuating a disease that seriously impairs the Nation's health, manpower, and economic resources. If dental decay were a direct cause of death, there would be little doubt of the widespread adoption of water fluoridation.